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PRESSES, Compressing, &c.—W. Bushell and W. T. Haydon, 4686.

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Johnson (com.). 4749. F. Hoyer, 4775. A. J. Boult (com.). 4789. J. E. Dawson (com.), 4822. J. Dobson, 4844. J. F. Haskins, 4938. E. P. Alexander (com.), 5004.

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Propelling Machinery, Transmitting Power and Motion, Converting Movements.—J. Johnson and R. Talbot, 4587. W. R. Lake (com.), 4643. W. P. Thompson (com.), 4687. C. D. Abel (com.), 4746. F. Wolff (com.), 4779. E. Sturge, 4798. R. Smith, 4804. W. Wade, 4893.

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Pulleys, &c.—T. B. Sharp 4595. G. E. Sherwin, 4905. C. J. Gullyes, 4952.

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Railway, Permanent Way, Rail Joints, Chairs and Sleepers, Portable Railways, Atmospheric Railways, Switches, Points, Crossings, and Turn-tables, &c.—A. J. Boult (com.), 4688. J. Hopkinson, 4718.

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Refrigerating and Freezing, Cooling Liquids, Making Ices, &c.—W. H. Beck (com.), 4579. W. W. Nightingale, 4660. P. Jensen (com.), 4703. C. Pieper (com.), 4770. T. Dowrie, 4817. M. I. Power, 4818.

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Steam Engines (Stationary, Locomotive, and Marine.)—W. R. Lake (com.), 4621. T. J. Handford (com.), 4674. C. A. and R. C. Parsons and J. H. Kitson, 4797. R. Smith, 4804. W. Crook (com.). 4906. W. Allan, 4969. A. W. Robertson, 4978.

Steering and Guiding, &c.—M. Horsley, 4518. E. J. Harland, G. W. Wolff, W. H. Wilson and W. J. Pirrie, 4637.

Sugar and Syrups, Glucose.—E. Death and J. Ellwood, 4498. W. R. Lake (com.), 5071.

Sulphur, &c.—W. Weldon, 4678.

Surgery, &c.—G. W. von Nawrocki (com.), 4856. H. J. Haddan (com.), 4934.

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Tarpaulins, &c.—R. C. Thompson, 4647.

Teaching, &c.—J. W. Cook, 4514. J. and W. Williams, 4943.

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Threads.—A. M. Clark (com.), 4927.

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Tobacco and Snuff, Cigars, Cigar-Holders, Pipe and Cigar-lighters, Smoking Pipes, Tobacco, Pouches, &c.—E. Large, 4456, T. E. Quick, 4622. O. W. T. Barnsdale, 4627.

Toys.—F. Wirth (com.), 4748.

Tramway Carriages, &c.—A. S. Clerk and F. Dowling, 5003.

Tramways, &c.—H. Scott, 4870. H. H. M. Smith (com.), 5005.

Traps for Drains, &c.—W. A. Barlow (com.), 4727. P. M. Justice (com.), 4936.

Trimmings, &c.—C. Jackson, 4649.

Turning, Lathes, &c.—W. Allan, 4685.

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Upholstery, &c.—J. Lokie, 4522. G. Lowry, 4702. B. J. La Mothe, 4704.

Valves, Taps, Stop Cocks, Plugs; Regulating the Flow and Pressure of Fluids.—R. Blakeborough, 4754. G. Wrightman, 4800. R. Smith, 4804. W. Teague, 4841. J. M. Hart, 4951. J. N. Sperryn, 4962. W. Key, 4981. J. Hayes, 4993.

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Ventilation: Supplying and Purifying Air for Buildings, Mines, Ships, Carriages, &c.—J. and J. K. Leather, 4519. H. Blair, 4592. W. W. Nightingale, 4660. A. Gandebein, 4739. W. Teague, 4850.

Washing, Cleansing, and Wringing Fabrics, Yarns, and Materials.—F. C. Glaser (com.), 4992.

Water-Closets, &c.—J. M. Hart, 4951.

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Windows, &c.—G. Hurdle, 4783. A. J. Boult (com.), 4839.

Wire, Wire Working, &c.—J. H. Johnson (com.), 4787.

Yeast, &c.—A. M. Clark (com.), 4874.

**** *The above List is prepared from the Patent Records by Mr. T. Morgan, Secretary of the Inventors' Patentright Association, Limited.*

Reviews.

THE WATCH AND CLOCKMAKER'S HANDBOOK.

"The Watch and Clockmakers' Handbook." By F. J. Brittern. Published by W. Kent and Co., Paternoster Row, London.

This handbook of about 180 pages should be a welcome addition to the practical library of every watch and clockmaker in the kingdom, as also of inestimable value to the great army of amateur mechanics, who are often seeking information of the character contained in this useful little book.

The work before us has arrived at the fourth edition, which shows the author's efforts have already been considerably appreciated; and we congratulate Mr. Brittern on the really practical value, unassuming though it be, of his treatise on watchmaking.

A FAREWELL.

Farewell! no more you shall see me
By day, or morning's dawn,
Or in the dim grey evening:
But, when dark night is here,
To hush life's discord like death's peaceful shade,
I shall be near your faithless footsteps' fall;
And watch those faithless eyes—perhaps retrace
Some fleeting sign I made on that false heart!
Then, if some tender chord of long ago
Breathes o'er your soul, when listening to the strain
Of night's winged laureate, the nightingale,
Revive the thought, and give my memory
One moment's recollection of the dreams
We dreamt together in love's Paradise.

V. Gonville.

Waterproof Paper.—According to the *Journ. Soc. of Arts*, a strong, impervious parchment-paper is obtained by thoroughly washing woollen or cotton fabrics, so as to remove gum, starch, and other foreign bodies, then to immerse them in a bath containing a small quantity of paper pulp. The latter is made to penetrate the fabric by being passed between rollers. Thus prepared, it is afterwards dipped into sulphuric acid of suitable concentration, and then repeatedly washed in a bath of aqueous ammonia until every trace of acid has been removed. Finally, it is pressed between rollers to remove the excess of liquid, dried between two other rollers which are covered with felt, and lastly calendered.

A Signal Clock.—A clock of novel make has been made by the American Watch Company, of Waltham, Massachusetts, for the use of the United States Signal Service. The case is of cast brass, and has a glass front through which the works can be seen. It is air-tight, and allows of a vacuum being created within by means of an air pump. The pressure can be kept uniform, and is indicated by a barometer outside. The clockwork is actuated by a mainspring 7 feet long, and making eighteen turns round the barrel. It is wound up by an ingenious electro-magnetic attachment which keeps winding it up the while it is running down. A metre-long pendulum interrupts the circuit at every beat, and actuates the electro-magnets. In this way the spring is kept at a constant power, say about fourteen turns. Should this electric circuit fail from any cause the stoppage is immediately indicated on the dial of the clock by a special hand. Meanwhile the clock continues to go for four days longer by the coiled portion of the spring. In case of need the uncoiled portion of the spring can be rapidly recoiled by tapping on a telegraph key in circuit.

SCHOOL BOARDS NO AID TO REAL EDUCATION.

Again another socio-politic public work is brought upon us by the School Board elections, and therefore prudence warns us to oust expensive candidates, or else Board action in the immediate future will cause some of you, by the heavy pressure of rates and taxes, especially School Board rates (which will be found the most oppressive item), to seek *in liquidation* as the only effectual remedy. To this jeremiad a friend says, "Nay! nay!" Have we not a government (termed liberal too) with Great William in fore front? That's the very reason to him, says this writer, why your money will be *liberally dealt with.* The leader is everybody, his praise fills earth, air, and sky, and he has at command a goodly number of such creatures as can be easily tempted, or driven, into their styes. The friend referred to has much to say on his side of the question. "Light and Knowledge," "Civilisation and Barbarism," &c., and he is well supported by the didactic and semididactic writers of the day. So the School Board, as it is now established, has a position one may say unquestionable; in fact, it must have more money spent upon it. and if it be necessary be fully authorised by heavy rating to prevent a poor striving writer having even a few new shirts in order that some shockheaded son of a huckster, in real wealth far in advance of shirt needing, be well crammed with abecedarian learning, that imparts to Huckster, junior, no real knowledge except perhaps arithmetic, though this, it appears, is in schoolboardism no great shakes.

As to the School Boards educating gutter children and street arabs, it appears they do not consider themselves bound to work for such ground hoppers, and we have recently had not only Mr. Samuel Morley but the Rev. Mr. Spurgeon, whilst pleading for ragged schools. stating: —The prevalent idea was that the Board schools had superseded the ragged schools. That, however, was a mistake; there was still a portion left that Board schools could not touch. There was a certain class of children that would attend Board schools, but they had no shoes or trousers. There were hundreds of children who were so ill-clad that they could not appear outside the door. What was to become of these wretched children? It was no use mincing matters; there must be a ragged school. He believed that there was as much need of ragged schools as ever there was, and he was sometimes afraid that there was more need. There was so much unthriftiness, extravagance, and depravity of all sorts, chiefly drunkenness, that there would always be uncared-for children, who ought to be cared for by their own parents, but who could not be, because the parents were not fit to be parents and knew not the sanctity of that relationship. The doctrine of human depravity which had been denied by some he lived to see taught by philosophers. They were told that not only had they the sins, the whims, and fancies of all the men they had descended from, but of all the gorillas, dogs, horses, tigers, elephants, and oysters right up to that primeval what's-his-name from which they all came. Never would the world be in such a condition as not to require the Gospel, and he urged those present to look to the little ones and especially the ragged little ones.

Thus the great work of Mr. Forster, which set nearly church and chapel ablaze, and the despotic compulsion which it was thought would produce a sort of revolution, has by sly and dry and persistent working become the tyrant of the day, and now seeks to get rid of its disagreeable work and take up with the best jobs only, such as Upper Board schools; that is, Up with the rates! School luxury for ever! But for the lowest classes, where is *the aid* to education? There have been eminent philanthropists on the School Boards; indeed, a great scandal occurred some time ago about an industrial ship business. Some see the Board does go in for this seafaring branch of technicality. Why not have managed to patch up the clothes and get comforting breakfasts for these urchins (work for School of Cookery). Lord Mayor and Mansion House could have been asked for help. This cookery affair reminds one that for *Technical Education* Mr. Lucraft and Mr. George Potter (hope both will be re-elected) with a few others mooted the matter, but it was let slip, so the Boards can claim nothing for aid to Technical Education. Moreover, have the School Boards by their practice, by example, improved general education? No. Nothing of the sort. It is simply an unpopular necessity. Let ratepayers fight it as its arch-enemy. Let the present system do its work, and if it be done well there will be no time lost, and then let the *people* take up the matter; so that education, facilitated for the poor and open to the rich, be properly organised—the general and classical and the technological or practical science studies. Furthermore, investigation—true and not of the logical lying official sort—must be effected. We must have a full account of all endowments; even Eton, Harrow, though hitherto kept for aristocratic paupers, be made to acknowledge their beggary and for the general advantage of society.

CITY AND GUILDS OF LONDON INSTITUTE.

The programme of Technological Examinations for the session 1882-83 of the City and Guilds of London Institute has just been issued. It differs in few particulars only from the programme of the preceding year, showing, presumably, that the revised regulations, under which the examinations have been this year for the first time conducted, have worked satisfactorily. A difficulty in obtaining good technical teachers appears to be still experienced by the Institute; and in the new programme some relaxation may be noted in the stringency of the conditions under which persons are to be registered as teachers of technology. Any person who is engaged in teaching science under the Science and Art Department, and who gives evidence of having acquired in the factory or workshop a practical knowledge of his subject, may now be registered as a teacher. The Central Building, the first stone of which in Exhibition-road was laid by the Prince of Wales. is rapidly approaching completion, and will, it is expected, increase the supply of competent technical instructors. Among the subjects of examination in the new programme is one addition—that of Flour Manufacture. Last year, Bread-making was added to the programme. The addition of these two subjects implying, it is supposed, that technical instruction is given in the details of these important industries, encourages the hope that as millers and bakers become better versed in the principles of their trade, the consumer may reap the advantage of this spread of technical knowledge in the enjoyment of more wholesome and cheaper bread. The Institute holds examinations in 42 different subjects. The syllabuses of these subjects have been carefully revised, and the lists of works of reference appended to them have been in many cases supplemented by notices of books which have been published during the past year. A glance at the list of examiners shows that the Council of the Institute have generally taken care to secure the services of men of high scientific attainments, whose names command the confidence of persons engaged in the trade to which the examination refers. Whether the system of examination and payment on results is a good system is open to question; but there can be no doubt that under this system the City Guilds Institute is doing much towards extending the advantages of technical instruction to artisans of all classes throughout the kingdom.

The Deserts of Africa and Asia.—M. P. de Tchihatcheff, in a paper read at the recent Southampton Meeting, contends that the great deserts of Africa and Asia are not sea-beds, recently laid dry, but they have been upraised at remote geological epochs, and that their sand is not of marine origin, but is the product of rocks disaggregated by winds, changes of temperature, &c. He admits that the Asiatic deserts are much more ancient than the Sahara. At a point in the Gobi, of the same latitude as Palermo, Russian explorers found, as late as May 16th, a temperature of 22° F., and snow two yards in depth!

Quick Work at an English Colliery.—A note was made recently of an example of rapid raising of coal at an American colliery. The following, which is regarded in England as a remarkable instance of expeditious work, will serve for comparison:—Pit No. 3, Newlands, near Baillieston, Braehead Collieries, is 120 fathoms deep. The engines are coupled horizontal, 18 inch cylinders, 4 feet 6 inch stroke, and the quantity of tubs drawn from the shaft for one shift was 1,865. The cages are double, holding two tubs abreast. For one hour's winding during the day there were drawn 240 tubs, giving an average for drawing, changing, &c., of 30 seconds for each "tow." The above quantity is coal only, so that including rubbish, &c.. drawn during the shift, there were considerably over 1,900 tubs brought to the bank. The average output is about 1,600 tubs per day.

A New Motor.—A new motor has been described which it is claimed will supersede steam. The material from which the energy is generated is bi-sulphide of carbon, which is utilised as a motor agent in the form of vapour, and the advantage claimed for it over steam is that, while water expands in the ratio of 1 cubic inch to 1,700, bisulphide of carbon has an expansive property of 1 to 8,000. When the vapour is generated it passes into the steam-chest of the engine and moves the piston rods. A pipe attached to the engine conveys the exhaust vapour directly through a condenser back to the tank in its original liquefied form to be re-generated. The system of generation and condensation is similar to the heart action, and with machinery perfectly constructed, it is claimed that a single supply of the bisulphide of carbon can be used with reinforcement for an indefinite period. Water boils at 212 deg., and it takes 320 deg. of heat to make steam available, while the new agent takes the form of vapour at 180 deg.

Testing Drains.—One very notable instance of the value of the smoke test in discovering imperfect joints is given by Mr. G. H. Stanger, C. E., in his treatise on "House Sanitation." He there says:—"When making a first inspection at the Wolverhampton General Hospital, and testing with the smoke test, by forcing smoke up the drains with a small fan blast, and thus finding out the untrapped inlets and leaky joints within the building, we discovered, among many other defects, smoke issuing from a pipe casing in the corner of one room. On examination it was found that an inch overflow pipe from a disused cistern had been cut off by some plumber, anxious, perhaps, not to contaminate the water supply, and the end communicating with the sewer left perfectly open into the room. On retesting to prove the work where the alterations were completed, one part of the basement was filled with smoke, and it was thus discovered that a temporary connection put in during the alterations had not been removed."

THE SUN AND ITS FUEL.

We find that the question of how the sun obtains his fuel is one which, along with the fate of comets, exercises the minds of a great number of people who have astronomical tendencies. The subject is one of great interest and worthy of investigation by the ablest minds; but we fear that the multiplication of mere speculations on the point will lead to no practical addition of real knowledge, or assured scientific advancement. It is therefore with no desire to add another theory, sensational or prosaic, to such as are already before the public that we now revert to the subject: but rather to point out a few difficulties in the way of one, at least, of the more recently suggested solutions of the great problem. We refer to the idea chiefly advocated, we believe, by Mr. Mattieu Williams, viz., that atmosphere is diffused throughout all space, and that the heat of the sun is developed and maintained by impact thereon, consequent on its forward or orbital motion.

In an article which appeared some time ago in the *Quarterly Journal of Science*, after having referred to the speed of the sun's journey through space, Mr. Williams has these words:—

"What must be the consequence of this motion? The sun will carry its own special atmosphere with it; but it cannot thus carry the whole of the interstellar medium. There must be a limit, graduated no doubt, but still a practical limit, at which its own atmosphere will leave behind or pass through the general atmospheric matter. There must be a heaping or condensation of this matter in the front, a rarefaction or wake in the rear, and a continuous flow of newly encountered atmosphere around the boundaries in the opposite direction to that of the sun's motion."

It is requisite to bear in mind that the advocates of this theory come to the conclusion of the universal diffusion of an atmosphere similar to our own, in consequence of its elastic properties, which they hold gives it infinite expansibility. Nevertheless, we need not interpret this to mean infinite divisibility of matter, although the reading of the writer's works already quoted tends, we think, to suggest that, individually, he also favours this conclusion.

Putting aside, however, this latter hypothesis, it will be well to look a little at what is consequent on the theory of infinite expansibility of the atmosphere. That the gases forming this are subject to gravitation on this planet is certain, for we find compression of the air to be the greatest when nearest to the earth. If, then, gases have an attracting power for the other forms of matter known as solid or liquid. whence comes the necessity to suppose that there is a destruction of the power of attraction, when in the gaseous state of the particles, one for another. That bodies have their force of cohesion overcome by a given amount of heat, and thus become converted into gas, should, we think, show that when the gas is robbed of the necessary heat, condensation will again take place, the inter-gravitating force being merely masked, as it were, in the meantime. By experiment we know that by combining an application of great pressure with a sufficient reduction of temperature, oxygen and other gases can be reduced, both to the liquid and to the solid. It would thus appear that to ensure an infinite expansion of a gas, we should require to have one universal and equal temperature throughout all space, and also at such heat as would permit of gaseous existence. As a matter of fact, temperature is not at one dead level everywhere, but, on the contrary, every variety of temperature possible to conceive of seems to be in operation around us. If we have given, say only one centre of heat, it becomes clear that as we recede from such centre we shall find perpetually reducing temperature.

We cannot, therefore, accept the calculations which have been made of the temperature of interstellar space as being anything more than the roughest approximations: for such temperature must entirely depend upon the distance from the various heating centres, and also the capabilities of the various mediums. It therefore appears clear to us that the expansibility of the atmosphere as it recedes from the central body is eventually balanced at a point where the temperature is reduced sufficiently, and that the ever present gravitation will then produce that defining line to a stratum of gas, which Mr. Williams appears to think exists in the cases of solids and liquids alone.

But for the time being we will consider the condition of things, under the supposition of the truth of the proposition as laid down in the article we have already quoted. In an universal atmosphere, the sun travelling 450,000 miles or more in 24 hours, would decidedly compress the medium in front to an enormous extent, and the earth's passage through the forward portion of the sun's path should certainly, to our minds, be accompanied with considerable increase of pressure, indicable by our barometers. The same would also be true, in a minor degree, as regards the continuous path of the earth's journey around the sun, if such is to be considered clear of the true atmosphere of the sun: and as a consequence that side of the earth, for the time being, which is receiving the impact of the supposed stellar atmosphere, should always show a greater pressure than the opposite side at the same time.

Under such conditions, however, the true atmosphere of the sun might extend to or beyond our orbit, or at least to that of Venus or Mercury, in which case it would appear that the pressure would come in the rear of these planets at one portion of their path. But the most important difficulty would seem to be that, if the resistance of this stellar atmosphere is converted into heat, then of necessity it must follow that the sun's motion through space is being rapidly retarded, which would as certainly mean approaching extinction as that entailed by any other theory yet propounded.

In pointing out these difficulties we do not desire to express the opinion that the sun receives no accession of force; for we think it highly probable that this is so, and will be for a long time yet to come; neither do we desire in the least degree to detract from the ingeniousness of Mr. Williams's or kindred theories. Nevertheless we do not doubt that, with further thought on the subject, these gentlemen will see that the difficulties in the way of their theories are such that by their adoption the mystery is as great as before.

For ourselves we do not see the necessity to search for a theory which would enable the sun to exist as such for ever, as a careful enquiry into the condition of other suns results in the conclusion that they are to be found in probably every conceivable stage of existence—from the, so to speak, youthful state of incandescent elementary gases, to the solid and totally extinct moving mass, giving no sign to us of existence, save that of gravitating power.

Truly both matter and force are eternal, but the forms of matter, even the most gigantic, such as the vast centres of light and heat, with which the universe is peopled are for ever changing. And they are probably the nearest to new life when they have arrived at apparent death.

HYDROPHOBIA.

No person we think who has the welfare of his fellow creatures at heart, can fail to feel a lively interest in all investigations connected with the terrible affliction of hydrophobia.

Recently, an exceedingly interesting communication was made to the French Academy of Sciences, by M. V. Galtier, detailing a series of experiments carried out by him with the virus of rabies upon a number of sheep and rabbits, the result of which would appear to go far towards establishing a hope, that some power over this horrible malady will soon be obtained.

The nature of M. Galtier's researches consisted of inoculations, practised in various ways upon animals, such as sheep and rabbits, specially set apart for this purpose, which resulted in the apparent conclusion that when an injection of virus is made *intravenously*, not only is the animal free from an attack of the disease but is also thus rendered impervious to the same when further inoculation takes place, either by hypodermic injection or by scarification.

We use the word "apparent" advisedly, for although in every one of the experiments narrated the wonderful results were the same, nevertheless, the subject is of such supreme importance that the utmost caution is needed in coming to the conclusions indicated.

All the animals which were inoculated by punctures in the subcutaneous tissue or by scarification contracted the disease, and died exhibiting the usual symptoms.

Rabies was also communicated to several animals by causing them to drink a mixture of water and the saliva of another afflicted brute.

But in all the cases where the virus was injected into the jugular vein, not only did no evil results occur, but the animals thus treated were proof against subsequent inoculations of the kind which had previously proved fatal without exception.

It would thus seem that animals such as sheep and rabbits intravenously inoculated with the virus of rabies, will not contract hydrophobia. but will receive immunity against it.

M. Galtier now proposed to verify the fact in the case of *the dog*, and also endeavour to ascertain if this form of injecting the virus, *practised a day or two after the bite, or an inoculation with virus, will preserve an animal from rabies.*

We need hardly say that if this should be found to be true, we shall enter upon an entirely new phase with regard to this disease, which up to now has, like the bite of some serpents, completely baffled the skill of the most learned of the medical profession.

Lifetime of Various Animals.—Camels live from 40 to 50 years; horses average from 25 to 30; oxen, about 20; sheep, 8 or 9; and dogs, 12 to 14. Concerning the ages attained by non-domesticated animals only a few isolated facts are known. The East Indians believe that the life period of the elephant is about 300 years, instances being recorded of these animals having lived 130 years in confinement after capture at an unknown age. Whales are estimated to reach the age of 400 years. Some reptiles are very long lived, an instance being furnished by a tortoise which was confined in 1633 and existed until 1753, when he perished by accident. Birds sometimes reach a great age, the eagle and the swan having been known to live 100 years. The longevity of fishes is often remarkable. The carp has been known to live 200 years; common river trout, fifty years; and the pike, 90 years, while Gesner—a Swiss naturalist—relates that a pike caught in 1497 bore a ring recording the capture of the same fish 267 years before. Insects are very short-lived, usually completing the term of their existence in a few weeks or months. Some even perish within a few hours after emerging from a grub state, and die upon the very day of entering on their new life. As a general rule, not to be applied too closely, larger types of animals live longer than smaller.

The Scientific Review

AND

SCIENTIFIC AND LITERARY REVIEW,

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SESSION 1882—1883.

First meeting of Session, 30th November, 1882, on which day it is proposed the Inventors' Dinner shall take place.

Subscriptions are payable to Mr. G. A. Stretton, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. Campin, Sec.

Proceedings of the Institute.

Notice:—The peculiar state of Parliamentary proceedings renders action on the Patent Laws a very difficult problem. We cannot, therefore, now appoint any day for meetings on the subject. Special notices will be given.

The President and Council direct the attention of Members to early forwarding of subscriptions, as the work of the Institute is now likely to lead to considerable expense.

Monthly Notices.

Telephone Experiments.—Mr. Wake, engineer of the River Wear Commissioners, and Mr. Irish, manager of the Northern District Telephone Company, have made some interesting experiments in the use of the telephone by divers. The length of the cable connecting the receiver in the diver's helmet with the transmitter above water was 600 yards. It was found that the diver could converse with ease and ask for tools in any position in which his work might require him to place himself.

Crayons in Vitrifiable Colours.—M. Lacroix, a Parisian chemist, has introduced crayons similar to the ordinary lead pencils, the lead being replaced by vitrifiable colours. The coloured designs which are executed with these crayons, on slightly roughened glass bear the heat of a muffle and are fixed like a painting upon glass, The greys, especially, give excellent results. A similar process, which was tried upon porcelain some years ago, was unsuccessful, probably because enamelled surfaces were used. On biscuit it is likely that good results might have been obtained.

Nature's Heat.—The Sutro Tunnel, now completed, discharges 3,000,000 gallons of hot water daily from the Comstock mines. This water has a temperature of 195 degs., and is conveyed through a closed pipe-flume to prevent the escape of vapour. After a passage of four miles through the first tunnel it loses suddenly 70 degs. of heat. A second tunnel 1,100 feet long and an open waterway a mile and a half long conduct the water to Carson River. Along its course are hot-water baths and laundries, and a plan is on foot to conduct the hot water through pipes under ground to be made available for purposes of irrigation and for supplying artificial heat to hot-houses.

Music by Telephone.—Among the special features of the Munich Electrical Exhibition is a telephone transmitting thither pieces of music performed at Oberammergau, which is about sixty-three miles distant; also a giant telephone, which transmits concert pieces performed in the English Café, so as to be audible to the whole of an audience in a large hall at the Palace. A special interest also attaches to the transmission of power by a single wire from the coal-mines of Miesbach, about thirty-seven miles distant, as the possibility of utilising the heat of coal at a distance without transport of the coal is concerned.

A New Steamer.—The new iron steamer *Albatoss*, lately launched at Wilmington, Del., for the use of the United States Fish Commission, says the *Scientific American*, will be ready for sea about December 1. Her dimensions are, length 200 feet, beam 27·6 feet, depth 16·9 feet. She will be provided with two large laboratories, one on the upper deck amidships, and the other immediately under this. In these laboratories all the microscopic work will be carried out and preparations made. One novel feature of this vessel for the pursuit of fish will be the use made of the electric light. The two methods employed will be the Brush for surface illumination, and the Edison for lighting up the depths of the sea. Her first extended trip will be to England, to carry to the London Fisheries Exhibition the exhibits of the United States Fish Commission.

Enamelling Cast-Iron Pipes and Castings.—A recently-invented process is as follows. There are various receipts for the enamel, depending on the purpose for which it is applied. One for water-pipes is as follows:—Twenty-eight parts by weight of silica, eleven calcined carbonate of soda, and six carbonate of lime. Another is:—Thirty-four silica, eleven carbonate of soda, twelve chalk, and eleven dried pipeclay, to which boracic acid or lead oxide can be added when a more vitreous enamel is required. The core forming the inner surface of the pipe—and, if desirable, the mould too—is coated with blacklead, smoothed, and the enamel as a powder, paste, or pigment, applied to the thickness required. The molten iron causes the enamel to soften and firmly adhere to the iron. If it is not necessary that the enamel should be smooth, the blacklead is omitted.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
INCORPORATING THE "JOURNAL OF THE INVENTORS' INSTITUTE."

NOVEMBER, 1882.

THE MANCHESTER SHIP CANAL SCHEME.

This is decidedly an age in which the advantages to be obtained by cutting great waterways across peninsulas, between great rivers, and direct to large centres of commence, are beginning to be thoroughly understood and appreciated.

The enterprising merchants of Manchester seem now to be awakened to the desire for direct communication with the sea, as a means of affording greater facilities for their rapidly expanding commerce.

They have gone so far as to start a fund of £100,000, which is being raised by subscription, for the purpose of the preliminary expenses of investigation, Act of Parliament, &c., preparatory to the formation of a great Company for carrying out the work.

Two schemes have been put forward by eminent engineers who have been engaged to make the necessary surveys and plans. The one promulgated by Mr. Leader Williams, C.E., has received the preference; although the difference in the two proposals is not very great, yet nevertheless important locally.

From what we know of the survey of the river and its surroundings, we can see no real engineering difficulty in the way of the completion of the work proposed, excepting, of course, the one common to all engineering operations, namely, the raising of the requisite capital. As, however, Manchester would appear to be in earnest on the question, this vulgar difficulty should form no barrier to progress. As usual, the great question is, "will it pay?" In all works of great engineering magnitude, the answer to this question is somewhat problematical; but an examination of the statistics available will, we think, give fair encouragement.

The district immediately surrounding Manchester comprises an area of about 2,500 square miles, with over 5,500,000 of inhabitants, giving a density of 2,200 to the mile. So that in this area the population to the square mile is between four and five times as great as in populous Belgium. In 1880 the total foreign trade or the United Kingdom amounted to £634,000,000.

The shipping of the Mersey and the Humber ports secured £249,000,000, and the port of London secured £194,000,000, leaving £192,000,000 as the value of the foreign trade carried on at all other ports of the three kingdoms.

No doubt the largest proportion of Manchester business passes through Liverpool, but that the other ports figure very largely the following will show :—

Exports of Leading Manufactures in 1880.

From	Textiles.	Metals.	Hard Goods.
Liverpool	£54,220,501	£10,684,123	£3,841,223
London	18,803,847	6,609,900	2,698,129
Humber	17,115,515	2,017,573	3,807,245
Southampton	5,322,658	316,814	423,535
	£95,562,521	£19,628,410	£10,770,132

It will be seen from the foregoing table that the larger proportion of the exports must proceed either from Manchester or its neighbourhood. But extensive as are exporting interests, the imports are of more consequence. A large proportion of the £180,000,000 worth of food imports must be consumed in the Manchester district, and when we take into consideration the value of the raw materials required for mills and workshops, we arrive at a very respectable total.

The Government returns do not give the values of goods carried coastwise, but a comparison of domestic with over-sea tonnage will make it clear that the coasting trade is of such magnitude that it must contribute to the business of the proposed port of Manchester.

The ship canal is advocated not merely on local grounds, but as an advantage to the community at large, and we believe the arguments which can be advanced in its favour, are such as will probably be effective when laid before Parliament.

As is quite natural, the good people of Liverpool have taken alarm on the subject, and it seems the prevailing opinion is that Manchester has been actuated in this matter by feelings of jealousy or rivalry; but we venture to think that something more substantial is needed to cause the hard-headed Manchester men to spend their wealth, than would be covered by motives of this description. Neither does it follow that any real injury will eventually be done to Liverpool any more than in past times the introduction of railways reduced the value of horseflesh, as was the fashion of those days to so confidently predict.

In any case we are content to think that the public at large must be the gainer by the increased facilities which will inevitably result from a great work of this description; and we shall in no way be surprised to find that, in the course of another twenty years, our own suggestion of completing the water-link by means of an extension of the Ship Canal to Leeds, and thence by river to the Humber, will be seriously entered upon. We are aware that such would pass through a very different kind of country to that of the present projection, but on the accomplishment of the lesser work the greater will both appear and become much easier. From the scientific point of view we emphatically hail the present attempt as a material sign of progress.

W. G.

COINING AT THE MINT.

We believe that most persons have but a very hazy notion of how the operation of coining is carried on at the Royal Mint; in fact, we have found that many practical men have imagined that an ordinary punching machine, very slightly modified, is all that is needed to make a sovereign. The modern process of minting money is, however, a very different kind of thing, and shows as much advance over the more primitive methods as any other industry in this or other countries.

To give some idea of the progress achieved in this direction, we quote the report made to the Lords of the Treasury in 1659 by Mr. Lowndes. This will sufficiently explain the state of the art, as attained up to that time, and is as follows:—

"All the moneys we now have, both gold and silver, are reducible to two sorts (1) stamped with the hammer, the other pressed with an engine, called the mill. The gold and silver is first cast from the melting pot into long bars, which are cut with shears into several square pieces of exact weight for sovereigns, angels, crowns, half-crowns, &c.; then with hammer and tongs they are forged into a round shape, after which they are blanched (*i. e.*, made white or refulgent by 'nealing or boiling), and afterwards stampt or impressed with a hammer to make them perfect money."

When the authorities of the Bank of England wish to coin gold, they give notice of the fact to the mint, and then send at fixed intervals consignments of 200 ingots of 180 ounces each, all of which have been previously assayed. When these arrive, they are, in presence of an officer of the Mint, taken to a small room, where a little piece of gold is taken from each ingot as a sample; this is hammered into a kind of strip, put into paper, and marked with the corresponding letter to the one on the ingot from which it was taken. These samples are termed "assay pieces," and they are weighed along with the ingots, and compared with the Bank weight. The Assay Master examines these pieces, and reports from them on the amount of pure gold contained in each ingot. If this report agrees with that of the Bank, the ingots are retained. The correct standard is twenty-two parts of pure gold to 2 of alloy, or 91·66 per cent. of gold and 8·33 of copper, which latter forms a harder alloy than silver, besides being very much cheaper.

The amount of metal melted in each pot is about 1,200 ounces, in the proportions named. The pot is constructed of Stourbridge clay, and plumbago, and is 9¼ in. deep and 7 in. across the top, inside measurement; being annealed, it is placed in the furnace. It is then covered by its muffle and lid, and well surrounded with fuel, which heats it gradually to redness, to avoid the risk of breakage. When the pot is fully red hot the ingots are carefully placed in it, along with the alloy, by means of a funnel, the whole is then covered up and left until the metal is liquid. The foreman stirs the molten mass with a rod composed of the same substance as the pot, until a temperature is reached known by experience as best conducive to the production of solid and workable bars. When all is ready the outside bars are removed, the fire drawn, the lid and muffle removed, and the pot lifted out by means of a crane. The foreman then takes the pot with a pair of tongs to the mould, when a man passes a loop over the button of the tongs, and supports the weight by a cord from the roof; charcoal is placed in the pot to reduce such oxide of copper as may be in the alloy, otherwise the bars would be too brittle to be to be workable. The charcoal rises to the surface of the metal, and so protects the alloy from atmospheric influence, and a rod of wood is held across the mouth of the pot to prevent any falling into the mould during the operation of pouring. The moulds are made of cast iron T-shaped, three pieces forming together two moulds. T ⊥ T; these are held by two cross-bars fitting into notches in the framing, and arranged with screws to force the moulds together. The contents of the pot will fill four bars, on the accomplishment of which the screws are loosed, the cross-bars taken off, and as the metal is exposed, the workman takes each bar and plunges it into cold water. The bars are marked to show the date and pot from which they have been poured, and two small assay pieces are taken from each.

The melting of silver is conducted somewhat differently from that of gold. In this case the pot is of wrought iron, of circular form 12 in. diameter, 15 in. deep, and when melting for florins is charged with 4,800 ounces of silver.

Standard silver is composed of 222 parts pure silver, and 18 of copper, or 92·5 per cent. of silver to 7·5 of copper. The pot on being lifted from the furnace is placed on a cradle provided with a tilting arrangement, and is caused to travel along the length of the moulds.

When the assay master has sent in his reports stating the metal is within the limits, an order is issued for the same to pass on to the rolling room, where the bars are all weighed again by the officer in charge before delivery to the rollers The silver is weighed to the ·10 of an ounce, and the gold to ·01 oz. The bars are given to the men, for the purpose of working them in batches of 20. These are first put into the breaking down mill, which consists of two powerful rollers, driven by shafts and adjusting couplings, and are provided with delicate apparatus for regulating the distance apart, at which the rollers are set to the greatest nicety. The bars are passed through this mill seven times, at each of which the distance of the rolls is re-adjusted, and at the conclusion the bars are about 7 feet long and very hard. After having their hollow ends cut off, and being divided into lengths of 18 inches by means of a powerful pair of shears, they are annealed in copper tubes, five at a time, by being run into the furnace for twenty minutes, and on withdrawal plunged into cold water as quickly as possible. After this they are passed through the mill four times without altering the guage of the rolls, and guaged to a thickness of ·117 of an inch in thickness. From this they are passed in succession through five other mills, so set that the thickness is successively reduced to ·075, .058, and finally to ·053 of an inch, and having a width of 1·829 inches.

At this point the guager cuts out blanks occasionally, and the same are weighed against a "standard," from which they must not vary more than ·50 of a grain. After the fillets have been weighed from the rolls to the drag room, they have their ends trimmed by small shears, and are then taken to the flatting mill, after which they are guaged to greater accuracy than when they left the rolling room. They next get in the hands of the trier, who cuts out a blank from each length, and weighs them against a standard weight, and in accordance with his judgment orders them to be cut by the machine men. The trier allows ·2 of a grain on the pound of blanks for loss in annealing which afterwards occurs. Notwithstanding all this care the fillets are not always accurate, and consequently two cutting out punches are used, having a difference of diameter sufficient to cover the variation in thickness, by which device out of 5,000,000 sovereigns coined, the trier has not deviated twenty shillings from the estimated value. The fillets from which the blanks are punched by the powerful machines have the appearance of ribbons perforated with round holes, and are called at the mint "scissel." They are bound up in bundles for remelting; in gold they weigh 180 ounces, and in silver 360 ounces.

The blanks are frequently examined to see that the edges are smooth, as if they are ragged from the action of a worn tool a loss would occur. Great care in this room is necessary, for blanks which leave cannot afterwards be altered.

The blanks are here weighed into drafts of 720 ounces each and placed in bags, and thence taken to the automaton balance, which distributes them into three divisions, light, medium, and heavy. Mediums are put into a bag for coining, the lights are sent back to the melting pot, and the heavies reduced. Each blank is rung by boys to detect cracked or dumb pieces, which are of course remelted.

They are then taken to the "Edge Compressor," which diminishes the diameter. This machine is adjustible, and will compress any size coin at the rate of 700 per minute.

After again annealing, the blanks are subjected to a process called "blanching," which is done by placing them for three or four minutes in a bath of nearly boiling dilute sulphuric acid. This removes the skin of oxide of copper formed on the surface, and imparts a beautiful bloom to the coin when it is struck. They are next washed in cold water and dried in a revolving drum containing sawdust, and kept in a heated chamber.

They are then carried in bags to the coining press, where by one blow they are stamped and the milled edge put on.

This press is one of Uhlhorn's lever presses, and was made by R. Heaton and Son's of Birmingham. It is noiseless in work, and requires little power for driving. In the coining of silver the blanching process is now dispensed with, and other modifications are made, as also in the case of the bronze money. Bronze consists of ninety-five parts of copper, four of tin, and one of zinc.

Table Showing Weight and Diameter of Current Coin.

Metal.	Denomination of Coin.	Weight in Troy.		Diameter.	Legal Tender.
		Grains.	Ounces.		
Gold ...	Sovereign	123·2744	0·2568	·8680	The highest sum known·
,,	Half-Sovereign ...	61·6372	0·1284	·7622	
Silver ...	Crown	436 3636	0·9090	1·5048	40 Shillings Sterling.
,,	Half-Crown	218·1818	0·4545	1·2714	
,,	Florin	174·5454	0·3636	1·1826	
,,	Shilling	87·2727	0·1818	0·9296	
,,	Sixpence	43·6363	0·0909	0·7648	
,,	Fourpence	29·0909	0·0606	0·6456	
,,	Threepence	21·8181	0 4545	0·6383	
Bronze	Penny...............	145·8333	0·3038	1·2000	One Shilling.
,,	Halfpenny*	87·5000	0·1822	1·0000	
,,	Farthing	43·8500	0·0911	0·8000	

* It may be interesting to some to know that ½d. is exactly 1 inch diameter, and laid on the Ordnance Map of 1 inch scale, covers 502·625 acres.

An improved smoking cartrdige has been patented by Mr. Edward A. Smith, of St. Albans, Vt. The shell of the cartridge is made of asbestos paper, and is not consumed in smoking and may be refilled. The cartridge filler is provided with wires that pass down into the shell, and after the shell is packed with tobacco are drawn out with the filler, leaving draught passages for air. A split metal collar fits over the end of the cartridge and into the end of the smoking tube, making a tight joint at the end of the tube.

THE TRANSIT OF VENUS.

It is surprising how few persons outside the ranks of trained astronomers have a clear conception of the method employed, to say nothing of the intricacy of detail involved, in measuring the distance to the sun by means of a transit of Venus.

In view of the approaching transit, and of the fact that over a century must elapse before the phenomenon will again take place, we will endeavour to explain in a rudimentary manner, for the benefit of our non-professional readers, the method of procedure.

When an engineer desires to measure the distance of a far-off object on the earth, he chooses a suitable base line of known length, and plants his theodolite first at one end thereof and then at the other, measuring in each case to the utmost nicety the angle subtended. Then, by means of the triangle thus obtained, he can, by the ordinary trigonometrical process, calculate the distance from either or both the points of observation, or the length of the perpendicular from the object to his base.

Why not then apply this process to the measurement of the distance of the sun? The reason is, that in practice it is impossible, with such instruments as we are able as yet to produce, to thus obtain with any certainty the correct value of the angles on such a base as is obtainable on this planet, in consequence of the enormous disparity between the distance of the sun and the size of the earth.

Venus, being a planet which travels in an orbit inside our own, will naturally at certain intervals pass between the sun and the earth; in doing which it will appear as a black spot moving across the face of the sun. This phenomenon is called the transit of Venus, and is used by astronomers as one of the best means available for determining the real distance of the sun. That this has been ascertained approximately a long time ago is quite true; but as the line from the sun to the earth has to be used as the measuring rod of the universe around us, it becomes of the highest importance that any error in its length should be reduced to the smallest proportions.

To show the importance of this, we will just mention that an error of one hundredth part of a second of parallax will make a difference of over a hundred thousand miles in the distance, and this hundredth part of a second is so small as to be only equivalent to the angle subtended by a single hair placed at a distance from the observer of 800 feet. It will therefore be seen that the most careful micrometric observations are required, together with the most accurate instruments it is possible to construct.

The diameter of the earth is now so well known that the error is probably within 200 feet. If, therefore, we can find out the apparent size or angular diameter of the earth when viewed from the sun, it is self-evident we should be able to at once obtain the value of one second in miles. Now this is precisely and solely the object in measuring the displacement on the solar disc of the planet Venus in transit.

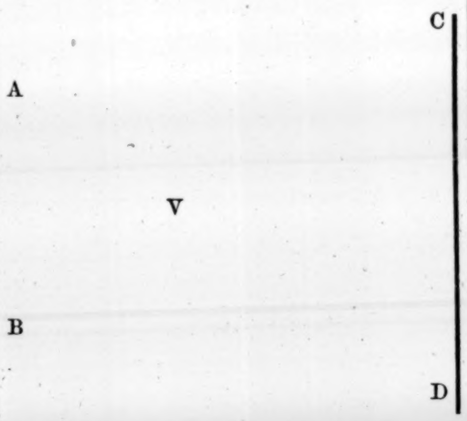
The accompanying diagram will show the method adopted.

Let the line at C D represent a part of the sun, A and B observers on the earth with telescopes, and V the planet Venus.

Now, if A adjusts his instrument on V he will see the projection of the image at D; likewise B will see the same at C. It is clear that the farther away the line at C and D is placed, the wider apart those points will appear; in fact, the two cross lines act like a pair of proportion compasses. But the distance between A and B is known in miles. If, therefore, we only know the *relative* distances of the three bodies we can easily compute their absolute distances.

The relative distances between the sun and the planets have been known since the days of Kepler. If, therefore, we call the distance from the sun to the earth 1, that from the sun to Venus will be 0·723, and of Venus from the earth 0·277. Then as the ratio of 0·277 to 0·723 is as 1 to 2·61, it follows that the ratio of the distance of Venus from the earth is to its distance from the sun as 1 to 2·61. Thus the space between the chords on the sun is to the two stations on the earth in the same ratio.

Simple as this method appears in theory, it also becomes quite another thing when reduced to practice. In the first place, the two ends of the earth's diameter cannot be used for the purpose of observation. Two convenient stations on the earth's surface have therefore to be selected, and the length of the line through the earth between these points is calculated. But radii drawn from these different stations to the centre of the earth are not equatorial; and as observers are numerous, much mathematical work is needed to express these radii in terms of equatorial radii. Again, although the mean distance of the earth from the sun is equal to 1, nevertheless the earth at the time of the transit on December 6th next will not be at its mean distance; but being near perihelion, will be less than unity. There are also motions of the earth and Venus at the time of transit which further complicate matters; and for all these things due allowance has to be made in the calculations.



However, when all corrections are made, it will be found under the refined micrometric manipulations of the skilled observers that the space between the chords on the sun's disc corresponding to a distance on the earth, equal to its mean equatorial radius, will be somewhere about 22·96 seconds of arc. This we have already shown is 2·61 times greater than the line that would be subtended by a semi-diameter of the earth at the same distance. We therefore divide 22·96 by 2·61, which gives us 8·8 seconds as the parallax of the sun. The mean equatorial radius of the earth is 3,962·72 miles, which if we divide by 8·8 gives us 450·30909, being the number of miles in one second of arc on the sun's central line. The diameter of the sun has been shown to be by repeated measurements, 1,924 seconds. We can thus by simple multiplication obtain such diameter in miles.

The sine of the angle 8·8 seconds is 0·000042663603928, and as the sides of any triangle are in the ratio of the sines of opposite angles, it follows that 3962·72 miles (the earth's equatorial radius) divided by 0·000042663603928, gives 92,882,917 miles as the distance from the centre of the earth to that of the sun.

For the benefit of those who have not a trigonometrical knowledge, a simpler though longer process may be shown. Starting with the 450·30909 miles as the length of a second of arc at the sun's centre, if we multiply the same by the number of seconds in the circle, we obtain the length of the circumference of the circle at a radius equal to the sun's distance from the earth. If we then divide this by the ratio of the circumference of a circle to its radius, we shall have the same results as before, thus:—

Length of one second in miles.		Seconds in a circle.		Circumference in miles.
450·30909	×	1,296,000	=	583,600,580

	Ratio.		Radius.
÷	6·283185307	=	92,882,917

All this, of course, depends upon the accuracy of measurement resulting in the parallax of 8·8; for should this turn out after all 8·81, the sun's distance would then work out to 92,777,488 miles, that is 105,429 miles nearer to us, whilst a parallax of 8·79 would make it the same amount farther away.

It must not be supposed, however, that the uncertainty arises from the difficulties of calculation already pointed out, for our astronomers and mathematicians are quite equal to problems of greater abstruseness than this. But solely is it in consequence of certain physical difficulties in the way of the simple micrometric measurements. The rays of the sun heating our atmosphere cause a peculiar tremulous motion in the focus of the telescope at the very point where the micrometer is fixed, which renders it exceedingly difficult to effect the measurements with the minute exactitude required.

Added to this is another atmospheric difficulty, but in this case it is that of Venus which is the trouble. The air surrounding that planet refracts to a certain extent the light, and so renders uncertain somewhat the precise instant of time at which contact takes place with the solar limb. It thus becomes necessary to observe numerous transits under the varying conditions thereof, so that eventually the distance may be obtained with as great a degree of accuracy as that of objects much nearer to us.

It may be thought by some that this possible error of 105,000 miles or so, more or less, is of very little importance; and so it might be considered if all uses of this measuring rod were in simple ratio; but in astronomical researches it is mostly involved in cubic ratio, which brings the error up to a very formidable amount. It thus follows that with the correction of the sun's distance it becomes necessary to revise the distance, weight, size, and density of every other planet in our system.

By Kepler's third law we know that the squares of the times of revolution of all the planets are in ratio of the cubes of their mean distances from the sun. We observe how long it takes Jupiter to go round the sun; then we square this time and extract the cube root, and we get at once its mean distance.

For instance, if we say that the earth revolves round the sun in a time equal to 1. and we then observe that Jupiter's revolution equals 11·86, all we have to do is to square 11·86, and then extract the cube root, which will bring us to 5·203; from which we know that whatever is the distance of the earth from the sun, Jupiter's distance will be 5·203 times greater. When we know the distance of any planet, its mass and volume become revealed by the law of attraction.

It is, therefore, a noble thing that competent observers should be equipped and sent out by the nations of the earth, so that we can transmit to astronomers unborn the highly perfected results of patient labour.

An invention for rapidly and cheaply *manufacturing nails* for securing wires to fence posts has been patented by Mr. Charles W. Dean, of South Wareham, Mass. The nail blank is cut in one piece from a band of metal in such a manner that both ends of the blanks are pointed without further cutting. As the blanks are detached they form hook-headed nails with sharp pointed ends, and when the points of the heads are bent so that their outer edges are parallel with the inner edge of the body the nail is complete.

RECENT AMERICAN AND FOREIGN PATENTS.

A cultivator.—Mr. Henry A. Robertson, of Haskins, Kan., has patented a cultivator that is easily controlled and adjusted. The axle of the cultivator is arched to form space for an auxiliary frame; at the rear end of the tongue is a short cross bar. From the ends of this cross bar braces extend forward and are secured to the tongue their rear ends being secured to the arch of the axle at its outer ends. Two inclined bars meet beneath the middle part of the tongue, where they are hinged, and their rear ends extend beyond the axle, and are attached to an arched bar the horizontal end parts of which pass through keepers on the plow beams. The auxiliary frame is suspended under the main frame by means of chains attached to the bars, and which pass up to and over a segmented pulley that is controlled by a latched lever in the reach of the driver, and by which the height of the ploughs is regulated.

Mrs. Loretta Brownlow, of East Paw Paw, Ill., has recently patented a simple and convenient means for *crushing and straining* fruit in making jellies, &c. The device consists of an outer colander made of earthen or other suitable material that is perforated in its sides and bottom, and is straighter in its sides than an ordinary colander, and an inner vessel which is made of the same shape and material as the outer, and has numerous small projections formed upon its outer surface to adapt it to produce a rubbing effect upon the fruit placed in the outer vessel. In the rim of the inner vessel are formed holes to receive the arms of a spider, adapted to be sprung into and out of the holes. To the centre of the spider is attached a crank, by which the inner vessel is turned within the outer to crush the fruit and press it through the perforations in the outer vessel. In the opposite sides of the rim of the outer vessel are formed holes to receive the inward projecting points of spring arm tongs, that are provided for holding the vessel stationary when in use. A cover which fits into the mouth of the inner vessel adapts it to be used for a variety of purposes when separate from the outer vessel.

Mr. Anton Besse, of Vienna, Austria, has patented a new apparatus for cleaning grits, grains, &c., thoroughly and in an economical manner. A box is provided at its top with a hopper, into which the grits are poured. The outlet gate of the hopper is opened by the descending grits, but prevents air from passing back into the hopper. From the lower end of the hopper the grain passes down through a series of air spaces and inclined plates, and at each space the lighter parts are blown over, leaving the heaviest grain at the last division, and the different weights pass into different receptacles. The motion of the air which passes through the air spaces is produced by a suction apparatus that is connected with a channel in the rear of the box.

An improved *locking bolt* for railroad rails has been patented by Mr. Thomas J. Bush, of Lexington, Ky. Bolts are bent in such a manner as to form short vertical necks on long diagonal arms, and the long arms are notched on one side near their lower ends. The short parts are formed with screw threads to receive nuts. In securing rails with the locking bolts the cross tie is first bored diagonally in such a manner that the holes will intersect each other at the proper depth. The bolts are then inserted in the holes, the notches on their sides intersecting each other, the nuts applied to the bolts and screwed firmly down to the flanges of the rail, the lower ends being securely locked together within the cross tie.

Mr. John Cochran, Jr., of Millwood, Mo., has patented an improvement in *churns*. The body of the churn is cylindrical in form and has a shoulder near its upper end to receive and support the cover. The cover is made in two unequal parts, the smaller part being loose. The larger part is held to its place by buttons that take under cross grooves in the churn body. To this part of the cover is secured a casing that contains and supports the driving gearing. The casing has an outwardly projecting arm, in which a shaft revolves, to one end of which is attached a crank; on the other end is a large bevel gear wheel the lower part of which meshes with a small bevel gear wheel upon a hollow shaft that revolves in a bearing on the churn cover. In the hollow shaft revolves another shaft having a small bevel gear that meshes with the gear of the driving shaft. To the lower ends of the hollow and solid shafts are attached cross bars to which are secured paddles. When the churn is filled and the handle turned the cross bars and their paddles move in opposite directions and the cream is rapidly agitated.

An improved *shaving mug* has been patented by Mr. Peter H. Leonard, of New York city. The invention consists in a shaving mug having a soap compartment provided with a spout projecting from the vertical partition of this compartment. This spout is bevelled from the upper edge of the partition, whereby when the cup is slightly inclined the surplus water can flow from the soap compartment into the lower part of the mug.

Mr. John Myers, of Philadelphia, Pa., has patented an improved washboard, the frame of which is of the usual construction, except the top and bottom cross-pieces, which are provided with bearings for pivots of vertical sections. The vertical sections consist of wooden slats covered with corrugated metal, and pivoted at their ends, upon which they are made to oscillate. These sections are provided with a lateral opening and are strung upon a rubber band, which passes through the openings, and is secured to the side frame of the board so as to yieldingly support the slats in one and the same plane. The washboard being open on both sides, and both sides of the sections corrugated, it may be used on either side, and will last twice as long as a board that is not reversible.

An improvement in *umbrellas, parasols*, &c., has been patented by Mr. Joseph Foster of Vienna, Austria. The umbrella is provided with a support formed of four rods, the upper ends of the upper rods being pivoted to the plate of the umbrella; the lower ends of the lower rods are pivoted to each other at the handle, the adjacent ends of the upper and lower rods being pivoted to each other. To hold the supporting frame when the umbrella is raised the upper rods are united by a brace having one end pivoted to one of the of the rods and the other pivoted to a sliding sleeve on the opposite rod, the sleeve being held by a latch lever. When the umbrella is opened the rods bend outward at their joints and form an irregular lozenge shaped opening, into which the head and hat of the person carrying the umbrella can pass.

An improved *clamp* for controlling the extension of gas fixtures has recently been patented by Mr. John F. Brown, of Brooklyn, N.Y. A circular case, apertured for the slide rods, has a screw collar for attachment to the fixture. In this case is an arrangement of disks and springs, and a spirally ribbed rod passing through the case and through apertures in the disks is checked in its movement by springs of such strength that their friction on the case holds the weight of the drop-light.

A *coffee and nut roaster* that permits of convenient examination of its contents has been patented by Mr. Thomas F. McCaffrey, of Philadelphia, Pa. The roaster is constructed in two cylindrical sections that are hinged to each other at their open ends. The edge of one section fits into the end of the other, and a hasp is provided for locking the sections together. Each section has a series of apertures for the entrance and exit of air, and a rod projects from their closed ends, on which the cylinder is rotated. Strips project from the inner surface to stir the contents of the cylinder when it is rotated, so that they will not become burned.

Mr. Solomon Kuhlman, of Canton, O., has patented a *guage* for regulating the depth to which holes are to be bored by an auger. A clamp holding a guage rod is so adjusted on the shank of the auger that the lower end of the rod will be from the lower end of the auger a distance equal to the desired depth of the hole to be bored. When the hole has the desired depth the lower end of the guage comes in contact with the surface of the wood and prevents a further penetration.

Mr. Watson F. Lamb, of Brooklyn, N.Y., has patented improvements in adjustable *easels*. The standard of the easel is adjustably secured to a pedestal having a cross bar and a roller, The work supporting frame is connected with the cross bar of the standard by a pair of hinged sliding bars, the bars being slotted longitudinally to receive a rod on which is placed a lever cam that clamps and holds the parts in position.

An apparatus for indicating the time of arrival and departure of trains has been patented by Mr. Joseph C. McKenzie, of Beaver Falls, Pa. A clock dial is provided at its edge with a rim to which adjustable tablets are attached indicating the time of the train. An index hand moved by clock mechanism comes in direct line with the tablets when the trains are due. If the hand has passed the tablet it shows how much the overdue trains are late.

A valve suitable for water tanks has been patented by Mr. Max Miller, of Brooklyn, N.Y. It consists in a spring strip attached to the inner surface of the tank, having a packing layer or disk attached to its inner surface, and covering the spout. A wire attached to the disk projects through the spout. By pressing on the wire the spring strip and disk is raised, and the water flows through the spout.

Improvements in apparatus for hanging, drying, and delivering wall paper from the printing machines have been patented by Mr. William J. Palmer, of Flushing, N.Y. The paper as it comes from the machine is received upon rods, and hangs from them in festoons. The rods are secured to an endless chain or belt, that is moved by suitable devices, and carries the paper through the drying room, and delivers it automatically to a reel to be wound in the usual manner.

A machine for addressing newspapers, &c., has been patented by Mr. William J. Palmer, of Flushing, N. Y. The paper as it comes from the machine is received upon rods, and hangs from them in festoons. The rods are secured to an endless chain or belt, that is moved by suitable devices, and carries the paper through the drying room, and delivers it automatically to a reel to be wound in the usual manner.

A machine for addressing newspapers, &c., has been patented by Mr. Martin M. Morrison, of Kansas City, Mo. Each address is formed upon a separate type block, made of rubber or other elastic material. The blocks are secured separately, side by side, on an endless movable belt. The belt is arranged with such devices that when a type block is pressed down a new block is brought into position for printing.

A *fire-escape*, that occupies but little space when not in use and can be quickly made ready for use, has been patented by Mr. Andrew Swanson, of New York city. The escape consists of ladders made of semicircular side bars, connected by rounds that are pivoted at their ends to the side bars, so that the side bars may be closed together.

The end of the rounds are formed square at one angle to press against the side bars, and prevent the rounds from passing below a horizontal position.

An improved *gate latch* has been patented by Mr. William H. Marshall, of Oxford, Miss. A latch provided with oppositely projecting side arms slides vertically in a recess in the end post of the gate. The lower face of the latch is recessed to adapt it to engage with a catch secured to the post. Two lugs that project toward each other are formed at the lower edge of the recess, and prevent the gate from being lifted from its hinges by animals.

Therese R. Fischer, of Baltimore, Md., has patented an improved *dress form* to be used for fitting and exhibiting dresses. The form is preferably made of willow rings, arranged in a horizontal position one above another, and connected by withes to which they are suitably attached. The rings are made of such relative sizes that the figure will have the general shape of a woman's dress. A frame having the form of one end of an ellipse is attached to a lower ring to support the train of the dress.

An improvement in *windmills*, by which the wind wheel is automatically adjusted according to the force of the wind, has been patented by Mr. Christian B. Harman, of Lanark, Ill. The vane of the wheel is pivoted to the stock to which the wind wheel is attached, and around which it rotates, and is so attached to the wheel by levers and connecting rods that by the force of the wind it is swung around to carry the wind wheel out of the wind, reducing its speed.

An improved method of making flexible *bracelets* has been patented by Mr. Shubael Cottle, of New York city. A ciroular spring is made of size sufficient to inclose the wrist. On the outside of this spring is placed a flexible casing, composed of spiral strips of sheet metal which are of a hollow, half-round cross section, wound in spiral convolutions about the spring with their convex sides out. The spiral strips are made ornamental, and the bracelet thus formed is easily expanded to pass over the hand to the wrist.

Mr. Robert M. Skiles, of Davenport, Ia., has patented improvements in *evaporators* and *heaters*. The air to be used for evaporating and heating is heated by pipes placed over a furnace, and connected to a pipe extending to the evaporating chamber through which it is drawn by an exhaust fan. and again thrown into the heating chamber to be heated, thus using the same air over and over and saving all the heat and also saving fuel.

Mr. Moses Cohen, of Hallettsville, Texas, has patented a mechanical *fan*, adapted to be attached to the ceiling and used in connection with a barber's chair. A swinging of metal or wood is secured to the ceiling at same distance forward of the chair; to its lower end are attached fans, and to its upper end a weight to retard the backward motion of the bar. By pulling a cord attached to the bar and passing over pulleys to the chair, the fans are operated.

An improvement in *sealing* devices for fruit jars has been patented by Mr. Johnston Irvin, of Elk City, Pa. The upper edge of the fruit jar is made wedge shape. The cover of the jar is provided with a wedge shaped annular recess, corresponding with the rim of the fruit jar, and in this recess is placed a rubber packing ring having inclined edges to fit the recess of the cover, and a wedge-shaped circular groove to receive the edge of the jar. The cover is held to its place by a screw cap.

An improved stump puller has been patented by Mr. Toliver Rice, of Enfield, Ill. Upon a suitable frame is pivoted a lever having a cam head and lifting chain. At the rear end of the frame is a shaft, provided with ratchets and pawls for winding, and holding chains that attach to the end of the cam lever. By this device great leverage is obtained for pulling stumps or for raising any heavy weight.

An improved method of making *latch needles* for knitting machines has been patented by Mr. Frank B. Woodward, of Hill, N. H., and consists in upsetting the wire from which the needle is made a short distance from the end, to form a lug in which a recess is made to hinge the latch of the needle. Much labour and expense are saved over the old method of reducing the wire to form the lug for the latch.

THE MICROSCOPE AND STRENGTH OF MATERIAL.—At a recent meeting of the Frankin Institute it was shown by Mr. Grimshaw that the microscope may be of good service in estimating the value of structural materials. It may determine whether or not the material is good enough to warrant trial with the testing machine. The author produced photographs of a chip of timber from a highway bridge that was wrecked two years ago, after a few days of service, through the strain caused by an empty truck; and the poor character of the wood was at once apparent. Such micro-photographs of timber, in fact, show that in the strong specimens, the concentric rings are close in texture and of slight width, and the radial plates frequent, wide, long, and thick, while the reverse is found in the poor material. As a parallel in metal-work, Mr. Grimshaw exhibited two portions of pure Lake copper, one in an ordinary ingot, of coarse and crystalline grain, dark red colour, and full of blow-holes; the other, cast with proper precautions against oxidation, the grain close and fine, the colour salmon, and no blow-holes. Tests of tensile strength of sheet and wire from these materials strikingly confirmed the indications of the microscope.

THE ALLIGATOR INDUSTRY.—The business of killing and catching alligators gives occupation, it is stated in a St. Louis paper, to many persons in the South of the United States. The hide of a large alligator is worth 1 to 2 dols. It is almost a day's task to skin a large one. Aligator oil (which has at first a most unpleasant smell) is much valued as a remedy for rheumatism. Fishermen sometimes eat portions of the animal's body; the flesh of the tail when cooked is said to be like veal in look and like pork in taste. Colonel Williams some time ago made a contract with a fisherman to stock a hole at Spanish Fort, known as the alligator pond, for him, and in a fortnight he had it stocked with thirty alligators, ranging from 6 inches to 7 feet or 8 feet. The mode of capture, in which the men showed no fear, was as follows:—Some of the young are caught out from where the old one is lying, and a strong noose is placed, so that she must thrust her head in it in emerging. When all is ready, the young are allowed to cry out, the old one appears, and is caught in the noose; she is then dragged round in the water till nearly choked, when another noose is secured to her tail, and she is firmly strapped, stomach downward, on a wide board. Her head is then fastened to the boat, the noose round her neck is removed, and she is towed away after her young have been placed in the skiff. Young ones are bought by dealers from 2 to 4 dols. a dozen, if not over a foot in length. They fetch a much higher price when retailed, as they are hard to keep alive. There is an increase in the selling price of 50 cents to 1 dol. for every additional foot over a certain length. Alligators 16 inches or 18 inches long are often found by dozens in shallow water, and they may be handled without trouble, provided the old one does not take alarm. Most alligator-fishers are usually turtle-hunters as well, pulling out the animals from holes with a hooked pole.

NEW ICE-MAKING PROCESS.—Some interesting experiments in the production of ice by a new system took place last week on the premises of the Aylesbury Dairy Company, Bayswater. The process, it is said, is quicker and cheaper than the means generally used for the production of either natural or artificial ice. A compound air-pump is employed to rarefy the air in a set of iron cylinders, in which a vacuum under four millimetres is established; and when pure water is pumped into this vacuum cylinder, five-sixths of it are in about half an hour converted into ice. When this is done, and the hinged floor of the cylinder is unscrewed, the admission of air above forces the ice down through the cylinder into an open receptacle. The outside of the column of ice is dense and white, something like alabaster; while the inside is beautifully honeycombed like stalactite fissures.

PREHISTORIC FOOTPRINTS IN NEVADA.—The recent discovery of human footprints at Carson, Nevada, has created great interest in American scientific circles. At a meeting of the Californian Academy of Sciences, Professor Joseph Leconté detailed the results of a careful examination which he has made of this locality. The Professor arrived at the conclusion that if the footprints were not in a quaternary formation they were not likely to be older than the upper pliocene passing into quaternary. He observed that no one who studied the tracks could fail to note their remarkable general resemblance to human footprints, both in their form and in the apparent singleness of each impression. Their size called for explanation: for, although well defined as rights and lefts, their straddle was unusually wide. They might have been made by a human foot enclosed in a raw hide sandal, much larger externally than the foot. The bear and mylodon, or gigantic ground-sloth, could alone make a track at all resembling the footprints in size and form, and they were not the tracks of either of these; they were those of a biped, more likely man or the anthropoid, familiarly known as the missing link in the chain of human evolution. The track was too much curved for any bear. Professor Leconté said he knew of no animal but a biped which could make such tracks, but this was possible for a man with sandals on to do. However, as a judicial mind, he desired to hold his final scientifically expressed opinion in reserve, awaiting further testimony.

GUNS VERSUS FORTS.—A council, composed of the Admiral and leading military authorities, has been sitting on board the Helicon to investigate the subject of the effect of the bombardment upon the forts. The ruined forts have been examined by officers of the marine artillery, of the navy, and the army, and their evidence is to the effect that masonry, as opposed to modern guns, is useless, as it crumbles to fragments under the impact of heavy missiles. Upon the other hand, the earthworks turned every shot, the projectiles simply ploughing deep trenches and turning upwards in the air. At Ras-el-Tin the guns were individually damaged, but at Forts Ada and Pharos the gunners deserted the guns, and the latter were not silenced by our fire. The investigation proved that our fuses were extremely bad, unexploded shells lying about everywhere. The direction of our fire was very good, but the elevation was by no means accurate. Of the tremendous rain of Gatling and Nordenfeldt bullets poured in there are but few traces visible, only two of the guns bearing marks of their fire. Many of the enemy's guns were put out of action by the effects of their own recoil. After a careful examination of the effects of our fire, the artillerymen are of opinion that properly-constructed forts ought to be able to resist the fire of ships, and that the only chance of the latter is to aim at the embrasures and endeavour to dismount the guns.

HOROLOGICAL MEMOIR OF THE HISTORY OF WATCHES AND CLOCKS—(From a Lecture by Sir John Bennett).—Two thousand five hundred years ago the Greeks, whom he termed a clever and ingenious people, had no pocket timekeeper, but a very good substitute, which they called a clepsydra, a diagram of which he proceeded to explain. The Romans 500 years after, having a greater affection for wheels and pinions, improved the clepsydra by introducing a clock dial regulated by drops of water, which represented seconds, and thus obtained time with considerable accuracy. Few improvements were made till the time of Galileo, who from the swinging of a chandelier, which kept time with his pulse, conceived the idea of measuring time by pendulum motion. John Milton paid a visit to Galileo, and took a treatise on Galileo's pendulum with him to Rotterdam, where he found a man to make him a clock, which he brought to London. Sir John then proceeded to show by means of his models the oscillation of the pendulum and its effects upon the escape-wheel. Great efforts were made to improve upon the first and ugly timepiece. The House of Commons offered a sum of £10,000 to £20,000 for the best approximation to accurate time. The result was that a Yorkshire journeyman, George Harrison, produced a chronometer which went to the West Indies and back with a variation of only two minutes. From that period the progress of watch manufacture was very marked. The lecturer then gave an account of his own efforts to improve the watch-making trade and diminish the price of watches. Alluding to the employment of female labour in the watch trade, he said his object had been to perfect the work of the men by female hands.

EMBALMING.—The principal Italian embalmers keep their special processes a secret, although the chief steps are well known. The process of embalming is stated to consist of five steps. First cold water is injected through the whole circulatory system until it issues quite clear. This may take as long as five hours. Alcohol is then injected, for the purpose of abstracting all the water from the body. This is followed up by the injection of ether, to dissolve out the fatty matter. This injection is carried on for several hours—in thin subjects for two, in very fat ones for even as long as ten hours. After this a strong solution of tannin is slowly injected, and full time is allowed for its soaking into all the tissues; this takes from two to five hours. Lastly, the body is exposed from two to five hours to a current of warm air, which is previously dried by passing it over heated chloride of calcium. The body can then be preserved for any length of time without undergoing change, and is as hard as stone.

ASSES' MILK FOR WEAKLY INFANTS.—In the Paris Academy of Medicine M. Parrot has recently called attention to some remarkable results obtained in the Hôpital des Enfants-Assistés, of Paris, in feeding delicate infants with asses' milk. Many of the infants brought to that hospital have diseases which forbid their being suckled by nurses (whom they would soon infect). Hence the feeding-bottle was formerly used for them; but, spite of great care, the endeavour to foster the small vital force of these children was of little avail. Direct application to the udder of an animal was then tried. At first the infants were thus fed with goats' milk, but it was soon found that asses' milk was greatly preferable, and all are now fed with that, one, two, sometimes even three infants being held to the animals' udders' at once. The nurses do this with great ease. The results of the treatment appear well from the figures cited. During six months, 86 infants having congenital and contagious diseases have been treated in the hospital nursery. Of the first six, fed with cows' milk in feeding-bottles, one only was cured. Of 42 fed at the goat's udder, eight were cured, while 34 died, Of 38 fed at the ass's udder, 23 have been cured while six have died. The virtues of asses' milk have been appreciated some time in France. For many years (we learn from *La Nature*) Paris and the large towns have been visited every morning with troops of she-asses, brought in to supply their milk for invalids. It is said the use of the milk was introduced by Francis I., who, reduced to a very weak state and a despair to physicians, was induced by a Jew from Constantinople to take asses' milk, and thereby got well again. This milk has much less of plastic matters and butter than goats' or cows' milk, and is easily digested. M. Parrot notices the practical advantages in the case of suckling from the ass, in that the animal is so easily fed; it is content with the poorest fodder. The goat suffers from a diet that lacks variety, and in the city its milk is not what it is in the country. The asses kept at the hospital referred to are in stables adjoining a field, in which they generally pass part of the day.

NEW AUTOGRAPHIC PRINTING METHOD.—The following method, by Mr. Crocker, of Tasmania, is described in the *Southland Times*:—The basis of operations is common window glass—a most unlikely but perfectly reliable material to withstand the rumble and roll of modern printing machines. A solid ink, composed of beeswax, resin, and lampblack, is made in proportions about which there is no secret. The drawing medium is a common steel pen, with this important adjunct, that it is constantly subjected to the action of a very tiny jet of gas, or an electric spark, which keeps the pen hot. It is inserted in the stick of ink, and its heat at once dissolves a "dip." The artist now proceeds to sketch on the glass, the fluid ink running as freely as necessary, but the instant it leaves the pen it again becomes solid, and adheres to the glass without blurring or running. As a consequence, shading of any intensity may be executed without risk of forming one big blot. The plate is now ready for an "engraver" whose hand is more potent and swift than that of any of his predecessors. This is hydrofluoric acid, a chemical well known as being about the only "eater" of glass known in practical chemistry. A small portion of this is poured over the face of the glass, and in a very short space of time eats its way downward. The ink, however, defies the acid, and the glass below the sketch therefore remains intact. All that now remains to be done is to mount the slip of glass on a metal block of the same height as printer's type, where it is secured with a little shellac, and the engraving is ready for the printing press.

PARIS AS A SEAPORT.—The French Society of Civil Engineers have recently had under consideration a project of M. Bouquet de la Gyre, Hydrographer to the Navy, for rendering Paris accessible to ships with a draft of six or seven mètres (say 23 feet). He proposes to deepen the Seine bed by dredging, and to lower the water level between Rouen and Poissy, so forming a maritime basin about 103 miles long and 150 feet in width, twice the width of the Suez Canal. The excavation would progressively reach a depth of about 53 feet below the present bottom at Poissy and the water level would be lowered about 40 feet. The quantity of matter to be removed is estimated at the enormous figure of 75,000,000 cubic mètres. Only the sharper curves of the river should be avoided; bridges should be raised or rendered movable. At Poissy vessels should rise by a "cascade" of locks, about 100 feet in the forest of Saint Germain, to an upper canal, fed with water from the Seine, by means of turbines driven by the fall of Seine waters at the Poissy. This canal would extend to Aubervilliers, passing above the Seine and the railways; its level would be nearly that of the canal of La Villette. There should be two harbours, a lower and an upper, at the borders of the forest of Saint Germain, and ships going to the higher canal should not interfere with those at the lower port, whence Transatlantic merchandise should be sent straight to the Rhine Valley. The expense of the lower canal between Rouen and Poissy is estimated at about 150,000,000 francs, that of the upper, about 100,000,000. The scheme has been vigorously discussed, and some eminent engineers have taken grave objection to it. Among other points the new behaviour of the waters of the Seine at low water, and in times of flood, the maintenance of the new bed, the expense of execution (thought to be under-estimated), are noted as presenting difficulty. The problem of the bridge between Rouen and Poissy is not regarded as easily solvable. It is asked, how will the *régime* of rivers or streams ensering the Seine between Rouen and Poissy be affected? How are their months to be treated so as to maintain their water level and avoid damage to property on their banks? What of the strong drainage of land along the Seine, with resultant injury to cultivation from lowering the level of the river? Will not the water falls at works, the foundations of houses, wells, springs, &c., be gravely compromised.

THE PLAGUES OF NEW ZEALAND.—The inhabitants of New Zealand are suffering from a plague of rabbits. It is not long since the first few rabbits were turned down in that country, the colonists being congratulated upon the appearance of the little native of the English field. The rabbits, however, have not proved an unmixed blessing. They increased and multiplied to such an extent that whereas in 1873 some 36,000 skins were exported, last year nearly 9,000,000 skins left the colony, and so serious had the nuisance become that, powder and shot making no perceptible reduction in the swarms of rabbits, they are being poisoned wholesale by grain soaked in phosphorus and oil of rhodium. A few English sparrows and linnets were also taken over and let loose. Now it is said that farmers cannot grow grapes, peaches, or plums for the birds, and fields of wheat, oats, and barley, are destroyed. It is sad that in New Zealand everything should thrive so well and the farmers suffer proportionately. Plants of certain kinds brought from England have been also found to work to the injury of the colony. "The watercress was transplanted, and at once it began to misbehave itself in the New Zealand streams. It grew and it grew and no human power could stop it, It increased in size, damming the streams and spreading up and down the rivers until it has to-day assumed proportions similar to that vegetable growth which in Central Africa stops the waters of the White Nile." Another increase has drawn attention to the wonderful power of development sometimes shown when an animal, bird, fish, or plant is taken from its old habitat and brought in contact with new surroundings. The shad, it is said, have increased to such an extent on the Pacific coast that the water is thick with them. The Americans are fond of this fish but they will probably think under the circumstances that things are going too far.

TREVITHICK.—It appears that a formal attempt will be made to celebrate in Cornwall the fiftieth year from the death of the great inventor Richard Trevithick, who was a native of that county, and who died and was buried at Dartford in 1833. Although many honours have been bestowed on the inventor of the locomotive and common road engine, of the high-pressure engine, and of so many applications of steam, a far greater share has befallen his successor, George Stephenson. As yet no statue has been erected to Trevithick in England, and it is thought that a statue will be a fitting tribute to him from his native county. The best memorial is in Canada on the Victoria Bridge, erected by Trevithick's son.

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